Indian Institute of Technology
Course Details Report

Course No: OE6005

Course Name: Reliability Of Offshore Structures

Course Type:

Theory

Description:

This course is about thinking how engineered systems fail, how to quantify the odds of such failures, and learning from contingencies to design new or retrofit existing systems. The ultimate goal is to improve complex systems' risk-based reliability and resilience.

The subject contains topics relating to probability, random variables and random processes aligned with principles of offshore structural mechanics. The course will .help Students to understand and design the offshore structure based on reliability analysis,

Course Content:

Review of basic probability, Random variables, probability laws, common probability distributions — origins and interrelations.

Functions of random variables, Joint probability distributions, conditional distributions, Joint Normal distribution. Simple one- and multi- variable example problems.

Introduction to Monte Carlo simulations, Generation of samples from various discrete and continuous distributions, generation of dependent samples.

System safety and reliability: Introduction and historical development, Reliability index, First-order reliability method (FORM), Second-order reliability method (SORM), Probability bounds.

Systems reliability: General .formulation of system reliability problems - representation of failure, series and parallel systems. Application to offshore structure,

Time to failure based formulation of reliability problems - components and systems.

Code regulations: DNV and API.

Case studies: Application to different offshore structures and problem-solving assignments.

Text Books:

1. AHS Ang and WH Tang, 1975, Probability concepts in engineering and design, Volume 1 - Basic concepts, John Wiley, NY
2. AHS Ang and W H Tang, 1984, Probability concepts in engineering planning and design, Volume II Decision, Risk & reliability, John Wiley, NY,
3. A Papoulis, and SU Pillai 1991, Probability, random variables and stochastic processes, 3rd Edition, McGraw-Hill, New York.
4. J R Benjamin and C A Cornell, 1970, Probability, statistics and decisions for civil engineers, John Wiley, New York.

Reference Books:

1. Nowak, A.S., and K,R. Collins, (2013). Reliability of structures, 2nd Ed. Boca Raton: CRC Press, Taylor and Francis group.
2. Rausand, M., and A. Hoyland, (2004). System reliability theory — Models, statistical methods and applications. 2 nd ed. New Jersey: John Wiley & Sons, Inc,
3. R. Ranganathan, 1999 Structural reliability analysis and design, Jaico Publishing House.
4. RE Melchers, 1999, Structural reliability: analysis and prediction., 2nd Edition, John Wiley,
5. I. Elishakoff, 1999, Probabilistic theory of structures, 2nd Edition, Dover.